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<input type="checkbox"/>	L5	L4 and (ApxI and ApxII)	4
<input type="checkbox"/>	L4	L2 and Actinobacillus	55
<input type="checkbox"/>	L3	L2 Actinobacillus	2772
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- ☐ 2. [20040202678](#). 10 Mar 04. 14 Oct 04. Actinobacillus pleuropneumoniae subunit vaccine. Segers, Ruud Philip Antoon Maria. 424/200.1; 435/252.3 435/471 536/23.7 A61K039/02 C07H021/04 C12N009/14 C12N001/21 C12N015/74.
- ☐ 3. [6783764](#). 31 Aug 99; 31 Aug 04. Actinobacillus pleuropneumoniae subunit vaccine. Segers; Ruud Philip Antoon Maria, et al. 424/236.1; 424/184.1 424/192.1 424/193.1 424/197.11 424/234.1 424/278.1 424/9.2 435/220 435/235.1 435/340 930/200. A61K049/00 A61K039/00 A61K039/38 A61K039/385 A61K039/02 .
- ☐ 4. [6019984](#). 23 Dec 96; 01 Feb 00. Bacterial preparations, method for producing same, and their use as vaccines. MacInnes; Janet, et al. 424/255.1; 424/184.1 424/278.1 424/823 424/824 424/825 424/826 424/827 424/828 424/829 424/93.2 424/93.4 424/93.48 435/243. A61K039/102 A61K039/02 A01N063/00 C12N001/00 .
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- ☐ 31. [6793927](#). 15 Dec 98; 21 Sep 04. Construction of *Pasteurella haemolytica* vaccines. Briggs; Robert E., et al. 424/255.1; 424/184.1 424/200.1 424/235.1 424/256.1 424/93.2 435/243 435/252.1 435/252.3 435/320.1 435/440 435/471 435/476 536/23.7. A61K039/102 .
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- ☐ 40. [6252044](#). 25 Nov 97; 26 Jun 01. Ribb. Black; Michael Terance, et al. 530/350; 424/184.1 424/200.1 424/234.1 424/235.1 424/237.1 424/244.1 424/93.43 530/300 530/324. C07K001/00 C07K014/00 A61K039/09 A61K039/02 .

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Construction and immunogenicity of a DeltaapxIC/DeltaapxIIC double mutant of *Actinobacillus pleuropneumoniae* serovar 1.

FEMS Microbiol Lett. 2007 Sep;274(1):55-62. Epub 2007 Jun 30.
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Growth phase mediated regulation of the *Actinobacillus pleuropneumoniae* ApxI and ApxII toxins.

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Analysis of non-porcine isolates of *Actinobacillus suis*.

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PMID: 7565014 [PubMed - indexed for MEDLINE]

- ☐ 5: [Jansen R, Briaire J, Kamp EM, Gielkens AL, Smits MA.](#)

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The CAMP effect of *Actinobacillus pleuropneumoniae* is caused by Apx toxins.

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PMID: 7705605 [PubMed - indexed for MEDLINE]

- ☐ 6: [Jansen R, Briaire J, Smith HE, Dom P, Haesebrouck F, Kamp EM, Gielkens AL, Smits MA.](#)

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Knockout mutants of *Actinobacillus pleuropneumoniae* serotype 1 that are devoid of RTX toxins do not activate or kill porcine neutrophils.

Infect Immun. 1995 Jan;63(1):27-37.
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- ☐ 7: [Tascón RI, Vázquez-Boland JA, Gutiérrez-Martín CB, Rodríguez-Barbosa I, Rodríguez-Ferri EF.](#)

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The RTX haemolysins ApxI and ApxII are major virulence factors of the swine pathogen *Actinobacillus pleuropneumoniae*: evidence from mutational analysis.

Mol Microbiol. 1994 Oct;14(2):207-16.

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Structural analysis of the *Actinobacillus pleuropneumoniae*-RTX-toxin I (ApxI) operon.

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The RTX haemolysins ApxI and ApxII are major virulence factors of the swine pathogen *Actinobacillus pleuropneumoniae*: evidence from mutational analysis.

Tascón RI, Vázquez-Boland JA, Gutiérrez-Martín CB, Rodríguez-Barbosa I, Rodríguez-Ferri EF.

Unidad de Microbiología e Inmunología, Facultad de Veterinaria, Universidad de León, Spain.

The involvement of the RTX haemolysins (ApxI and ApxII) of the swine pathogen *Actinobacillus pleuropneumoniae* in virulence was investigated using haemolysin-deficient mutants constructed by a mini-Tn10 mutagenesis procedure. Two types of haemolysin mutant with single insertions of the transposon were obtained from a serotype 1 strain producing both ApxI and ApxII. One presented a complete loss of haemolytic activity because of the absence of ApxI and ApxII production. The other displayed weaker haemolysis than the wild type and produced only ApxII. The chromosomal regions flanking mini-Tn10 were cloned and sequenced. In the non-haemolytic mutant, the transposon had inserted in *apxIB*, a gene involved in the exportation of ApxI and ApxII toxins. The weakly haemolytic mutant resulted from the disruption of the structural gene for ApxI. Both mutations in the *apxI* operon were associated with a significant loss of virulence for mice and pigs, demonstrating that haemolysins are involved in *A. pleuropneumoniae* pathogenicity. The non-haemolytic mutant was apathogenic and the weakly haemolytic mutant retained some virulence for pigs, suggesting that both ApxI and ApxII are needed for full virulence.

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Association of the CAMP phenomenon in *Actinobacillus pleuropneumoniae* with the RTX toxins ApxI and ApxII. [FEMS Microbiol Lett. 1994]

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The RTX haemolysins ApxI and ApxII are major virulence factors of the swine pathogen *Actinobacillus pleuropneumoniae*: evidence from mutational analysis.

Tascón RI, Vázquez-Boland JA, Gutiérrez-Martín CB, Rodríguez-Barbosa I, Rodríguez-Ferri EF.

Unidad de Microbiología e Inmunología, Facultad de Veterinaria, Universidad de León, Spain.

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☐ 5. [6019984](#). 23 Dec 96; 01 Feb 00. Bacterial preparations, method for producing same, and their use as vaccines. MacInnes; Janet, et al. 424/255.1; 424/184.1 424/278.1 424/823 424/824 424/825 424/826 424/827 424/828 424/829 424/93.2 424/93.4 424/93.48 435/243. A61K039/102 A61K039/02 A01N063/00 C12N001/00 .

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